

4-4-11



AFS 313,375

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**PATENTEE:** Horst Grafe et al.  
**PATENT NO.:** 7,117,776  
**ISSUED:** October 10, 2006  
**FOR:** HIGH-SPEED SHEAR FOR TRANSVERSE CUTTING OF A ROLLED STRIP

**EXAMINER:** Timothy V. Eley

**Group:** --

Mail Stop:  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

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- *js*  
*7/5/11*

March 31, 2011

**STATEMENT OF FILING BY EXPRESS MAIL 37 C.F.R. §1.10**

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**SUBMISSION UNDER 37 C.F.R. § 1.501**

Sir:

Patentees respectfully request that the documents listed on the attached form PTO/SB/08a be placed in the file of the above-referenced patent. Copies of foreign patent documents are enclosed. A translation of the foreign language document(s) is not readily available.

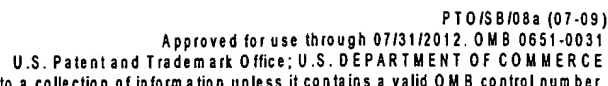
The Japanese Publication JP Sho 60-91310U discloses a high-speed shear with upper and lower knife drums (1, 3) having different diameters, and two support rollers (7, 8) arranged in front of and behind the drums and capable of being lowered and lifted, so that during the idle runoff the drums the knives (2, 4) do not touch the cut strip (S).

Respectfully submitted,

Alexander Zinchuk

Alexander Zinchuk, Reg. No. 30,541

Abelman, Frayne & Schwab  
666 Third Avenue, 10<sup>th</sup> Floor  
New York, NY 10017-5621  
212-885-9383



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**Complete if Known**

(Use as many sheets as necessary)

of

Application Number	Patent No. 7,117,776
Filing Date	Issue date: Oct. 10, 2006
First Named Inventor	Graf
Art Unit	2500
Examiner Name	T. V. Eley
Attorney Docket Number	AFS 313.375

[illegible]

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>2</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
		UK 464,264	04-14-1937	United Engineering and Foundry Co.	Entire document	
		JP Sho 60-91310(U)	06-22-1985	Nakanishi Hiroshi	Entire document	

Examiner  
Signature

Date	Considered
11/1/80	11/1/80
11/2/80	11/2/80
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup>Applicant's unique citation designation number (optional). <sup>2</sup>See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup>Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup>For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup>Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup>Applicant is to place a check mark here if English language Translation is attached.

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# PATENT SPECIFICATION



Convention Date (United States) : March 14, 1936.

464,264

Application Date (In United Kingdom) : Oct. 28, 1936.

No. 29291/36.

Complete Specification Accepted : April 14, 1937.

## COMPLETE SPECIFICATION

### Improvements in or relating to Flying Shears for cutting Moving Material

We, UNITED ENGINEERING AND FOUNDRY COMPANY, a Company organized under the Laws of the State of Pennsylvania, United States of America, of 2500, First National Bank Building, Pittsburgh, Pennsylvania, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improvement in what is commonly referred to in the cutting art as flying shears, and more particularly to shears of the type in which the cutting blades are supported upon opposed power-driven rotary carriers or drums.

Shears of this kind are employed principally for cutting a moving web into preselected lengths, without interrupting its movement, and to function properly it is desirable that they be able not only to cut a wide variety of lengths, and to do so without damaging or marking the surface of the web between cuts, but also have their cutting blades moving at the instant of cutting at substantially the speed of the web or at a tolerable relative speed. To obtain these objectives such shears have taken many forms. For cutting relatively short lengths it is a rather simple problem to incorporate these features in a shear of this type. To satisfy such requirements the blade carriers or drums can be feasibly designed to produce the cuts required within not more than one revolution, and hence readily operated, within a tolerable range of speed, relative to the speed of the web to vary the length of cuts within the limits required. When the lengths become very large, however, the problem presented becomes somewhat complex because, if the lengths of cuts exceed greatly the circumference of the path of travel of the cutting blades, it is necessary either to stop and start the shear between cuts, separate the carriers between cuts, or so design the carriers that they make a plurality of revolutions between cuts. For most purposes the latter type of shear is preferred. In

shears of this type, however, especially where used in the metal working art towards which this invention is more particularly directed, the cutting blades will strike and damage the surface of the strip between the cuts unless provision is made to prevent such action. To overcome this difficulty some shears of this kind are provided in which the cutting blades are rotated or otherwise moved with respect to the carriers so that they will not engage the web except when it is desired to produce a cut. Such construction, however, especially in heavy metal shears, is usually undesirable and for many purposes impractical because of the operating instrumentalities which it requires.

With the aforementioned problems in mind it is an object of this invention to provide in a rotary shear, and especially a rotary shear of the drum type, in which the carriers are adapted to be revolved a plurality of times between cuts for preventing the blades marking or damaging the web between cuts, and for doing so without disturbing either the axis of rotation of the carriers or the permanent mounting of the cutting blades.

This and various other objects as well as the various other novel features and advantages of the invention will be apparent when the following detailed description is read in conjunction with the accompanying drawings, in which Fig. 1 is a sectional view of a shear constructed in accordance with the invention for cutting metal strip; Fig. 2 an end elevation of the shear shown in Fig. 1; Fig. 3 is a diagrammatic view of a modified form of the invention; and Figs. 4, 5 and 6 enlarged views showing the conditions obtained with the use of this invention.

Referring in detail to the drawings, and first more particularly to the embodiment of the invention illustrated in Figs. 1, 2, 4, 5 and 6, the numeral 1 designates a shear housing and the numerals 2 and 3 a pair of blade carriers or drums which are suitably mounted in the housing for rotation about fixed axes. As shown, these drums are of different diameters and

[Price 1/-]

are provided with a pair of cooperating transversely extending cutting blades 4 and 5, respectively, which are adapted to sever the strip or web 6 into predetermined lengths when they are brought into cutting opposition as the strip is passed between them.

In this particular embodiment of the invention let it be assumed that the drums 2 and 3 are made of different diameters which bear the relation of 3:4 to each other, and that they are geared together by suitable gears 7 and 8 which cause them to rotate at the same peripheral speeds. This insures the cutting blades being brought together on each fourth revolution of the upper drum 2 and on each third revolution of the lower drum 3. Consequently, if operated to have a peripheral speed equal to the lineal speed of the web, they will produce cuts equal to four times the circumference of the path of travel of the upper blade or three times the circumference of the path of travel of the lower blade. In other words, the upper blade 4 is adapted to pass over the strip three times between each cut while the lower blade 5 passes under the strip twice between each cut. With such an arrangement it has been found very difficult and practically impossible to guide the strip between the two drums without the edges of the top and bottom knives alternately striking the strip and seriously marking it. This marking is prevalent in both hot and cold shearing and when hot shearing, i.e., when shearing strip as it is delivered by a continuous hot strip mill which has a temperature of about 1400° F., the marking is at times so great as to render the coil unfit for the purpose for which it was intended.

Assuming that the top and bottom drums have a diametric ratio of 3:4 respectively, each time the bottom knife passes its strip marking position, as shown in Fig. 1, the top knife is at least 120° from its corresponding position; likewise, when the top knife is passing its strip marking position, the bottom knife is at least 90° away from the strip. This fact is taken advantage of, in the practice of this invention, as will be apparent to those skilled in the art after a further study of the description.

In accordance with this invention, to avoid detrimental marking of the strip, table 11 is adjusted at an angle to the horizontal to guide the strip through the shear in such a manner that it is normally urged against the top drum 2 and therefore out of the path of the bottom knife 5. To avoid contact with the strip by the top knife, there is provided deflecting

block 9 mounted on and projecting from the top drum 2 slightly in advance of and parallel to the top knife 4. This block 9 is made of any suitable material such as wood or soft metal and provided with a blunt strip engaging surface. The purpose of this block 9 is to engage the strip and temporarily deflect it out of its normal path and away from the top knife 4 and against the bottom drum 3, the distance between the top knife 4 and the bottom drum 3 being sufficiently great to permit passage of the strip. The block 9 is, of course, given the necessary height and spaced the proper distance from the blade to properly perform its function, and by virtue of the speed of the strip and shear, the strip will not return to its original line of travel until the knife is safely past its strip marking position. These dimensions, as will be apparent, may vary somewhat for different sized drums and for drums which are operated at different speeds. It is to be understood that the block 9 may, if desired, be integral with and of the same material as the drum.

While the blade carriers are illustrated in the form of drums, it is to be understood that any suitable shape of carrier may be employed which will properly support the cutting blades and the deflecting rib, and that any suitable drive may be employed for operating them, such as a motor 10 coupled through a drive 10a to the shaft of the upper blade carrier 2, it in turn being operably connected to the lower carrier by the gears 7 and 8.

The embodiment of the invention shown in Fig. 3 differs from that described in connection with Figs. 1 and 2 only in that the drums have been inverted and two blades have been shown on the larger drum instead of one. With the same drum diameter and diametric ratio, this arrangement would permit the shearing of lengths one-half as long as those which could be sheared by the arrangement shown in Fig. 1, i.e., a cut would be made every second revolution of the lower drum 2a and every one and one-half revolution of the upper drum 3a.

It will be obvious from the foregoing that the strip may be guided against the periphery of the bottom drum instead of against the top drum, in which case the deflecting block would be mounted on the bottom drum in advance of the knife, and I wish to have it understood that the strip may be guided at random through the shear and a deflecting block mounted on both drums in advance of the knives.

It will be understood that various modifications may be made in the

arrangements described without departing from the scope of the invention.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A flying shear having a pair of rotatable blade carriers with a cutting blade on each of said carriers and means for so rotating said carriers as to bring said cutting blades into cutting opposition only after a plurality of revolutions of one or both carriers, means being provided for deflecting the material to be cut away from the cutting blades between cuts.

2. A flying shear comprising a pair of drums equipped with projecting cutting blades and means for guiding the material to be cut against the periphery of one of said drums, and including means mounted on said latter drum for deflecting the material away from said drum just prior to the approach of said projecting knife.

3. A flying shear comprising a pair of blade carriers or drums of different radii equipped with cutting blades, and means for causing at least one of said drums to make a plurality of revolutions between cuts, means being provided mounted in advance of the blade on the latter drum for striking the material to be cut and deflecting it out of the way of said blade each time said drum is rotated.

4. A flying shear according to claim 3 including means for supporting and delivering material through said shear

along a plane which is tangential to the periphery of one of said drums and which is not intersected by the blade on the other drum in its path of travel, said deflecting means being disposed tangentially to the path of travel of the material.

5. A flying shear for cutting moving material comprising a pair of rotatable blade carriers with a cutting blade mounted on each of said carriers, and including a material deflecting member mounted on each of said carriers in advance of the cutting blade.

6. In a flying shear, a rotary blade carrier equipped with a cutting blade positioned to intersect the normal path of travel of the material through the shear each time it is rotated through a complete revolution, and means mounted on said carrier in a position to engage the material ahead of the cutting blade as the carrier is rotated and deflect the material away from the blade so that the blade will not strike the material except when a cut is being made.

7. A flying shear substantially as hereinbefore described and illustrated in the accompanying drawings, for the purpose specified.

Dated this 28th day of October, 1936.  
For UNITED ENGINEERING AND  
FOUNDRY COMPANY,

Stevens, Langner, Parry & Rollinson,  
Chartered Patent Agents,

5—9, Quality Court, Chancery Lane,  
London, W.C.2, and at  
120, East 41st Street, New York, U.S.A.

[This Drawing is a reproduction of the Original on a reduced scale.]

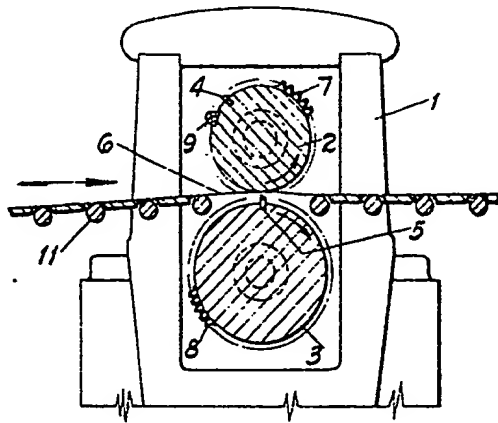


Fig. 1

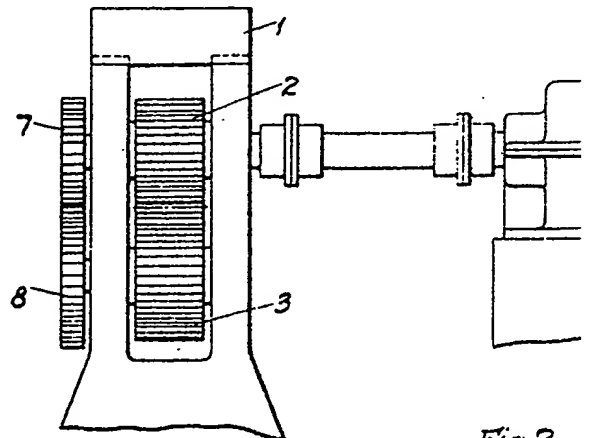


Fig. 2

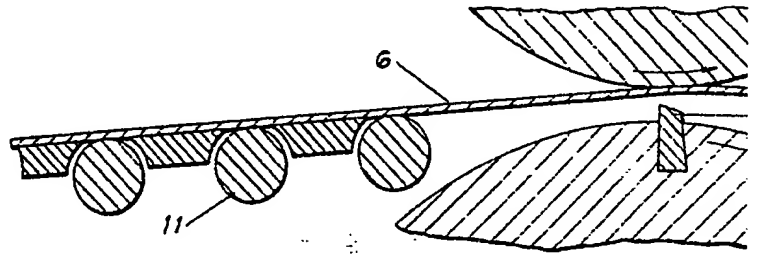


Fig. 4

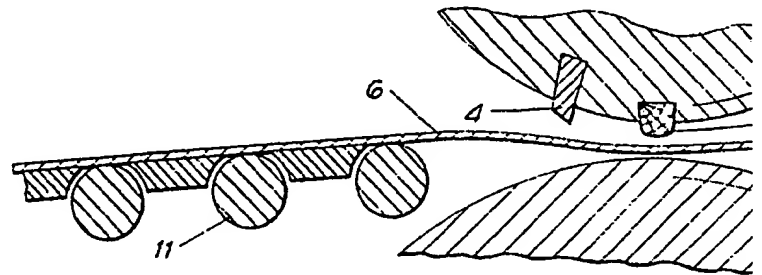


Fig. 5

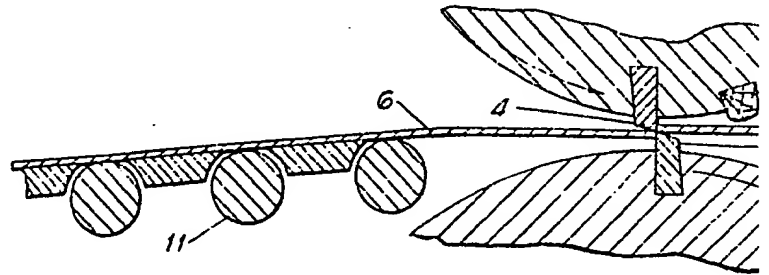


Fig. 6

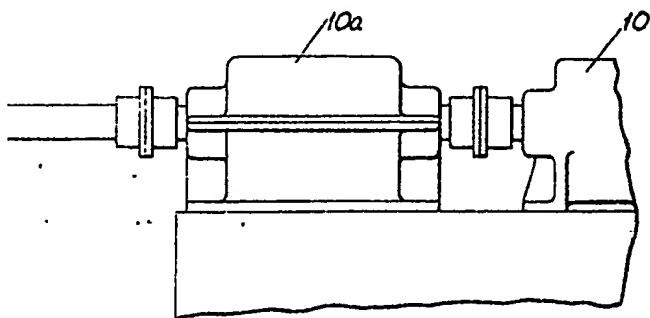


Fig. 2

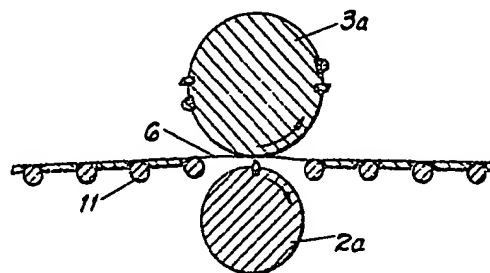


Fig. 3

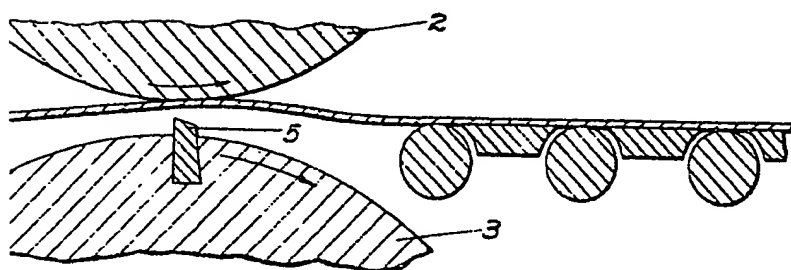


Fig. 4

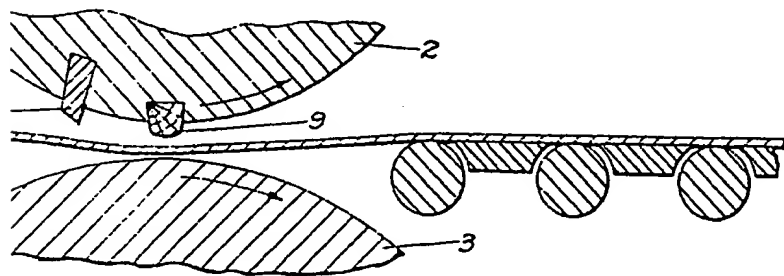


Fig. 5

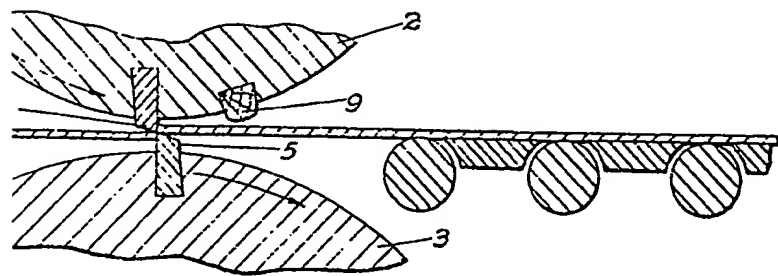
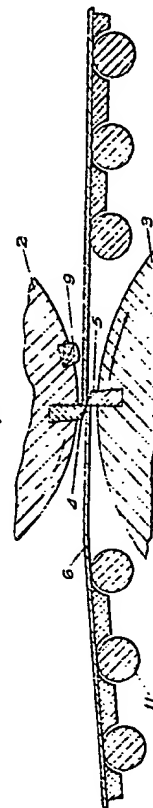
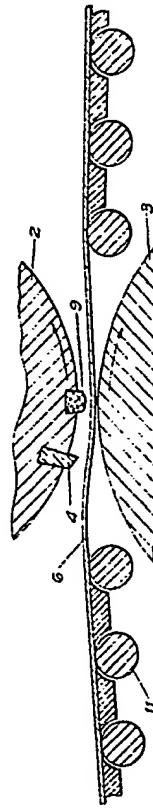
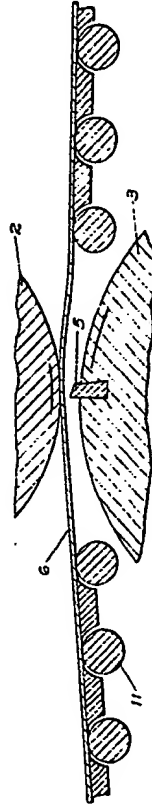
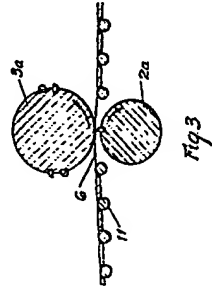
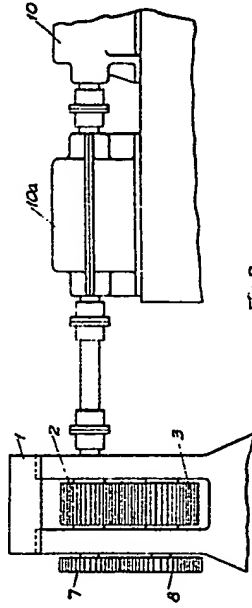
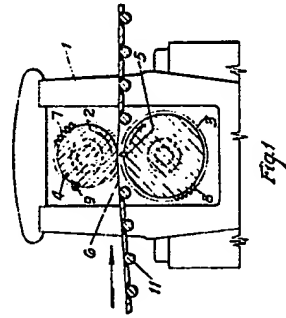


Fig. 6





⑩ 日本国特許庁(JP)

⑪ 実用新案出願公開

⑫ 公開実用新案公報(U)

昭60-91310

⑤ Int. Cl.<sup>4</sup>  
B 23 D 25/12識別記号 庁内整理番号  
7336-3C

④ 公開 昭和60年(1985)6月22日

審査請求 未請求 (全2頁)

⑭ 考案の名称 ドラムシャー

⑮ 実 願 昭58-184285

⑯ 出 願 昭58(1983)11月29日

⑰ 考 案 者 中 西 博 横浜市磯子区新中原町1番地 石川島播磨重工業株式会社  
横浜第二工場内⑱ 出 願 人 石川島播磨重工業株式 東京都千代田区大手町2丁目2番1号  
会社

⑲ 代 理 人 弁理士 山田 恒光 外1名

## ⑳ 実用新案登録請求の範囲

夫々刃物を備えた上下一對のドラムの前後の少なくともいずれか一方に被切断材を支持する昇降自在なローラを配設したことを特徴とするドラムシャー。

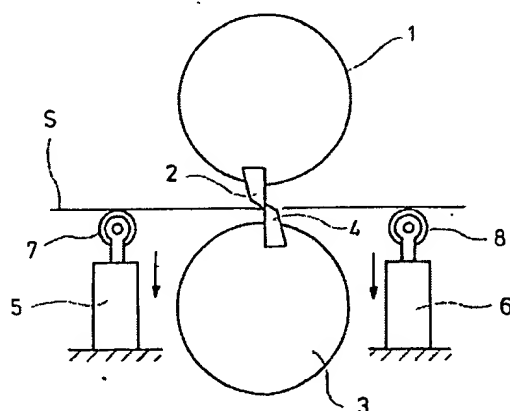
## 図面の簡単な説明

第1図及び第2図は本考案のドラムシャーの説明図で、第1図は被切断材を切断する場合の説明

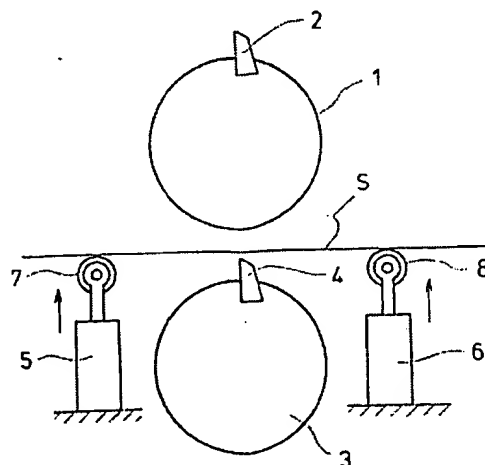
図、第2図は被切断材を切断しない場合の説明図、第3図イ〜ホは本考案のドラムシャーで上、下ドラムが回転する際のローラの位置の説明図である。

図中1は上ドラム、2は上刃物、3は下ドラム、4は下刃物、5、6は流体圧シリンダー、7、8はローラを示す。

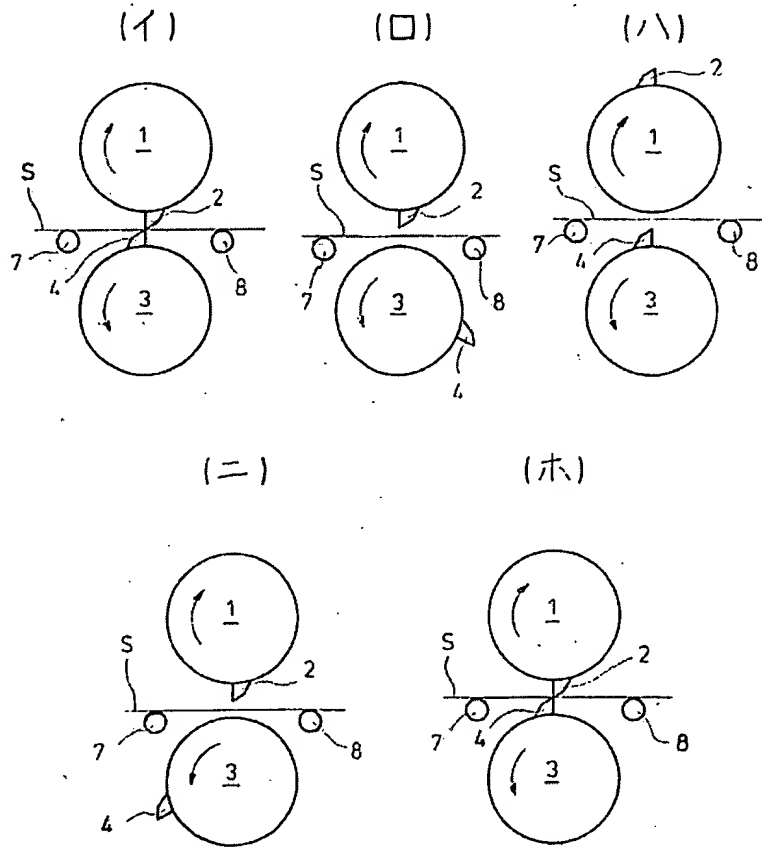
第1図



第2図



第3図



公開実用 昭和60— 91310

⑬ 日本国特許庁(JP)

⑪ 実用新案出願公開

⑫ 公開実用新案公報(U) 昭60-91310

⑤ Int.Cl.<sup>4</sup>

識別記号

庁内整理番号

⑭ 公開 昭和60年(1985)6月22日

B 23 D 25/12

7336-3C

審査請求 未請求 (全 頁)

⑮ 考案の名称 ドラムシヤー

⑯ 実 願 昭58-184285

⑰ 出 願 昭58(1983)11月29日

⑱ 考 案 者 中 西 博 横浜市磯子区新中原町1番地 石川島播磨重工業株式会社  
横浜第二工場内

⑲ 出 願 人 石川島播磨重工業株式 東京都千代田区大手町2丁目2番1号  
会社

⑳ 代 理 人 弁理士 山田 恒光 外1名

## 明 細 書

### 1. 考案の名称

ドラムシャー

### 2. 実用新案登録請求の範囲

- 1) 夫々刃物を備えた上下一対のドラムの前後の少なくともいずれか一方に被切断材を支持する昇降自在なローラを配設したことを特徴とするドラムシャー。

### 3. 考案の詳細な説明

本考案は、被切断材にミスカットによる疵が付かないようにしたドラムシャーに関するものである。

圧延設備等において、コイル分割時生産量アップのため高速分割が望まれているが、高速になるとドラムシャーを短時間に加減速する必要があり、駆動モータが大きくなり、設備上問題があった。

そこで、ドラムシャーのドラムの数回転ごとに1回ストリップを切断すれば、駆動モータの容量を数分の一にすることができる。しかし、



この場合にはミスカットにより被切断材に疵を付ける虞れがある。

本考案は上記観点到鑑み、駆動モータの容量を小さくすると共に被切断材に疵が付かないようにしたドラムシャーを提供することを目的として成したものである。

以下、本考案の実施例を添付図面に基づき説明する。

第 1 図及び第 2 図中 1 は上刃物 2 を固着された上ドラム、3 は下刃物 4 を固着された下ドラムであり、上、下ドラム 1, 3 は図示していない駆動装置により回転し、上、下刃物 2, 4 により被切断材 S を切断し得るようになっている。

上、下ドラム 1, 3 の前後には竖向きの流体圧シリンダー 5, 6 が配設され、該流体圧シリンダー 5, 6 のロッド上端には被切断材保持用のローラ 7, 8 が回転自在に枢着されている。

上、下刃物 2, 4 により被切断材 S を切断する場合には、第 1 図に示す如く、流体圧シリンダー 5, 6 によりローラ 7, 8 を下限まで下降させ、



下限位置でローラ7,8により被切断材Sを支持させる。

被切断材Sを切断しない場合には、流体圧シリンダー5,6によりローラ7,8を上昇させ、該ローラ7,8により被切断材Sを支持させる。従って、上、下ドラム1,3が回転しても、ミスカットにより被切断材Sに疵が付くことはない。

第3図(イ)～(ホ)は本考案のドラムシャーで上ドラム1が3回転する間に下ドラム3が2回転する場合のローラ7,8の昇降状態を示す図である。第3図(イ)に示すように、被切断材Sが切断される際はローラ7,8は上昇している。又被切断材S切断後、上ドラム1が1回転し、下ドラム3が $2/3$ 回転した場合はローラ7,8は第3図(ロ)に示すように下降し、下ドラム3が1回転し、上ドラム1が1.5回転した場合はローラ7,8は第3図(ハ)に示すように上昇し、上ドラム1が2回転し、下ドラム3が $1\frac{1}{3}$ 回転した場合はローラ7,8は下降し、第3図(ニ)～(ホ)の間では被切断材Sは切断されない。而して、第3図(イ)の状態



から上ドラム1 が3回転し、下ドラム2 が2回転すると、第3図(外)に示すようにローラ7,8 は上昇し、上、下刃物2,4 により被切断材S は次の切断を行われる。

なお、本考案の実施例では、被切断材を支持するローラを流体圧シリンダーにより昇降させる場合について説明したが、ドラムにリンク機構を設け、該リンク機構によりローラを昇降させても良いこと、ドラムにより回転するカムを設け、カムによってローラを昇降させることもできること、刃物の軌跡が楕円形の場合はドラムを昇降させなくとも実施できること、又昇降するロールはピンチロールを用いても良いこと、その他、本考案の要旨を逸脱しない範囲内で種変更を加え得ること、等は勿論である。

本考案のドラムシャーによれば、ドラム数回転につき1回被切断材を切断することができるため、駆動モータの容量を小さくできて省エネルギーを計ることができ、ミスカットにより被切断材に疵がつかないため、板の品質が良好に





なる、等種々の優れた効果を奏し得る。

#### 4. 図面の簡単な説明

第1図及び第2図は本考案のドラムシャアの説明図で、第1図は被切断材を切断する場合の説明図、第2図は被切断材を切断しない場合の説明図、第3図(i)～(n)は本考案のドラムシャアで上、下ドラムが回転する際のローラの位置の説明図である。

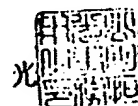
図中1は上ドラム、2は上刃物、3は下ドラム、4は下刃物、5,6は流体圧シリンダー、7,8はローラを示す。

実用新案登録出願人

石川島播磨重工業株式会社

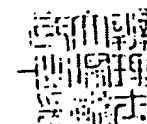
実用新案登録出願人代理人

山 田 恒

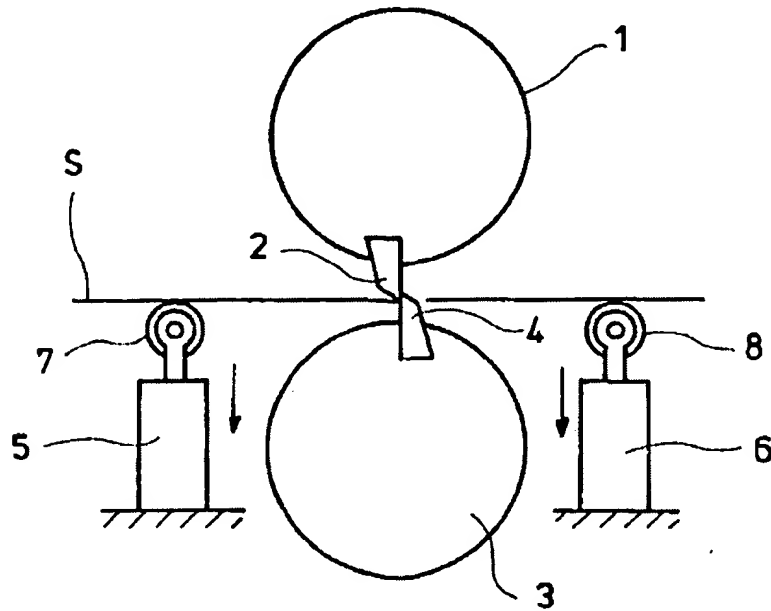


実用新案登録出願人代理人

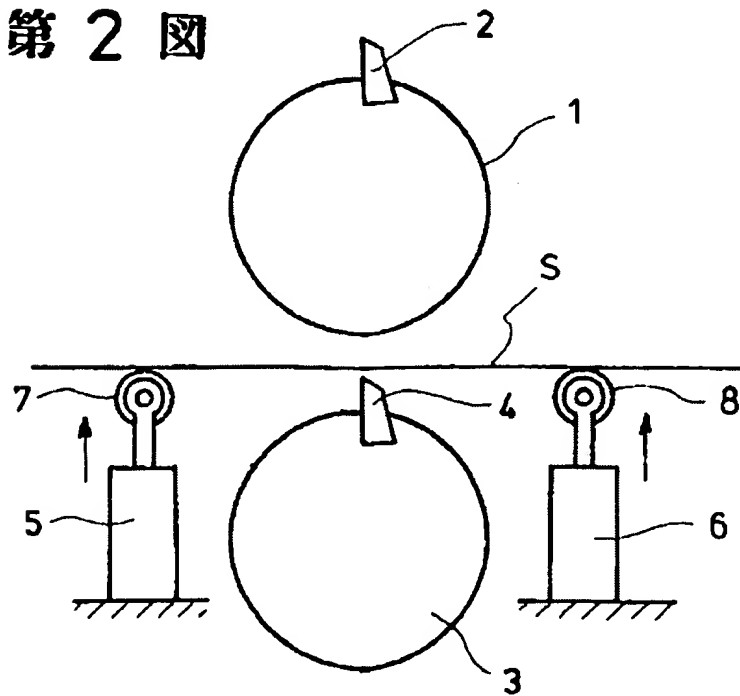
大 塚 誠



第 1 図

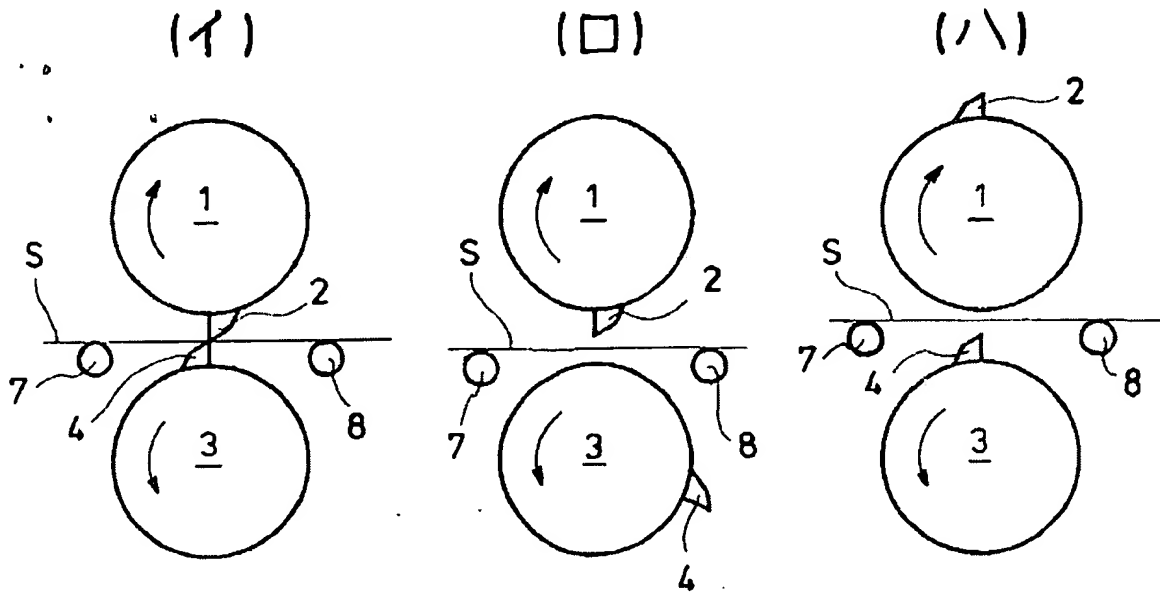


第 2 図



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# 第 3 圖



(二)

(ホ)

